

IWBAT discover the sum of the angle measures in a polygon, practice construction skills, and develop reasoning and problem-solving skills.

Polygon Sum Conjecture

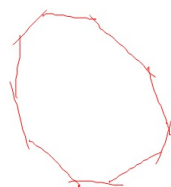
Polygon - a closed shape composed of three or more line segments

Each partnership will draw several examples of their polygon. They will then measure the interior angles of their polygon and sum the measures. The partnership will come up with a conjecture for their particular polygon.



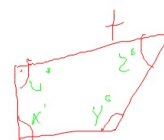
- ☒ Quadrilateral
- ☐ Pentagon
- ☐ Hexagon
- ☐ Heptagon
- ☒ Octagon
- ☒ Nonagon
- ☒ Decagon
- ☐ Hendecagon
- ☐ Dodecagon

The sum of the # angles of any name is #.



$$a + b + c + d = 360^\circ$$

$$x + w + y + z = 360^\circ$$



IWBAT discover the sum of the angle measures in a polygon, practice construction skills, and develop reasoning and problem-solving skills.

Polygon Sum Conjecture The sum of the _____ angles of any _____ is _____.

- Quadrilateral *The sum of the 4 angles of any quadrilateral is 360°. > +180*
 - Pentagon *5, 540° > +180*
 - Hexagon *6, 720° > +180*
 - Heptagon *7, 900° > +180*
 - Octagon *8, 1080° 6*
 - Nonagon *9, 1260° 7*
 - Decagon *10, 1440° = 180 × 8*
 - Hendecagon *11, 1620° = 180 × 9*
 - Dodecagon *12, 1800° = 180 × 10*
- 180 × (n - 2)
degrees inside a
convex polygon
of n-sides*

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Polygon Sum Conjecture

Polygon sum conjecture

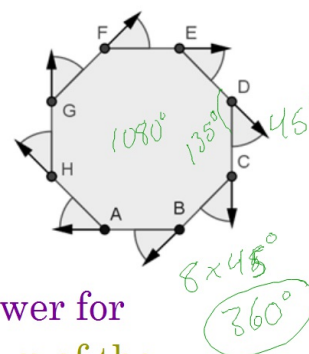
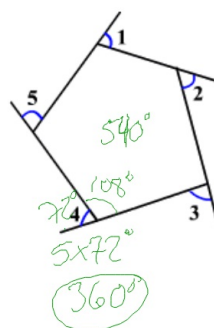
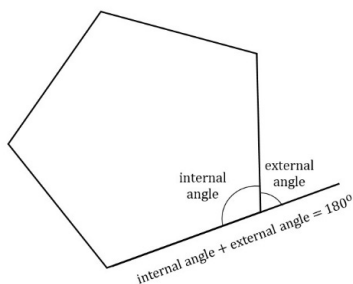
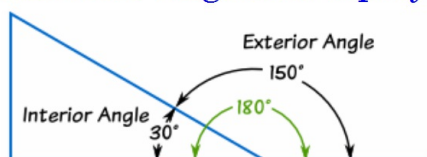
The sum of the n interior angles of an n -gon is $180(n-2)$.

Exercises DG pp. 257-8 #1, 2, 5, 6, 8-11

IWBAT discover the sum of the angle measures in a polygon, practice construction skills, and develop reasoning and problem-solving skills.

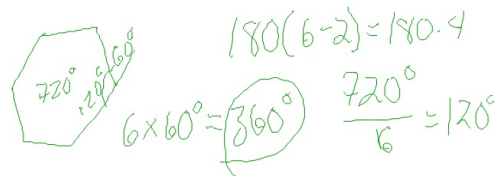
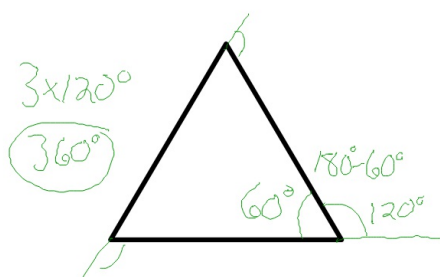
IWBAT discover the sum of the measures of the exterior angles of a polygon.

Exterior angles of a polygon



8/31/16

Can we get a single answer for "For any polygon, the sum of the exterior angles is 360°."?



IWBAT discover the sum of the measures of the exterior angles of a polygon.

Exterior angles of a polygon

How can we use this to find the interior angle measurements?

$$\frac{360}{n} = \text{exterior angle}$$

$$180 - \text{exterior angle} = \text{interior angle}$$

$$360(n-180)$$

$$360(5-180) = 63000^\circ$$

$$\frac{360}{n} - 180 \quad \frac{360}{5} - 180$$

$$-108^\circ$$

$$180 - \frac{360}{n} \quad 180 - \frac{360}{5} = 108^\circ$$

Can we write a conjecture for an equiangular (regular) polygon?

You can find the measure of an interior angle of a regular polygon with the formula

$$180 - \frac{360}{n} \quad \text{or} \quad \frac{180(n-2)}{n}$$

IWBAT discover the sum of the measures of the exterior angles of a polygon.

Exterior angles of a polygon

Exercises DG p. 262 #1, 4-12 all

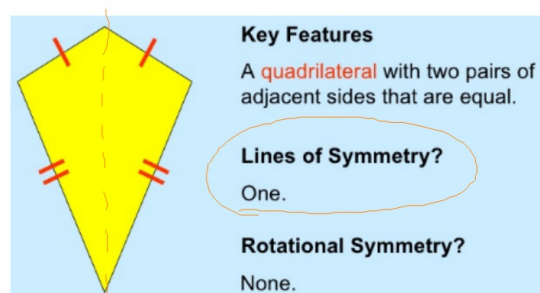
IWBAT discover the sum of the measures of the exterior angles of a polygon.

IWBAT discover properties of kites and trapezoids.

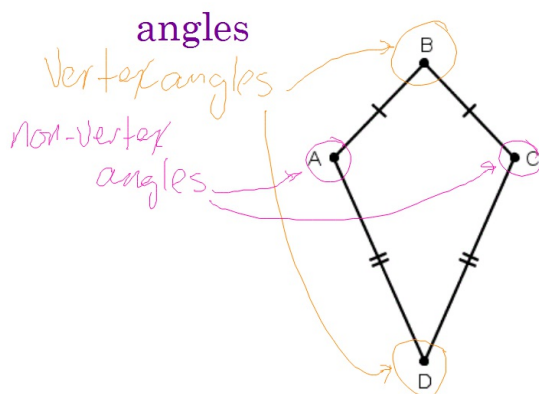
Kites and Trapezoid Properties

What can we say about kite

- angles,
- diagonals,
- diagonal bisectors,
- angle bisectors?



We need to form a conjecture for each.



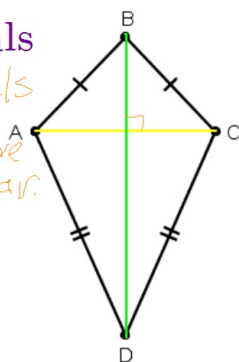
The vertex angles of a kite are never congruent. The non-vertex angles are congruent.

IWBAT discover properties of kites and trapezoids.

Kites and Trapezoid Properties

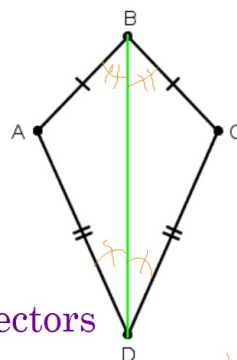
diagonals

The diagonals of a kite are perpendicular.



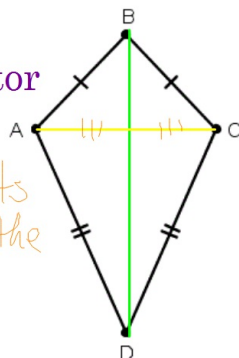
angle bisectors

The diagonal connecting the vertex angles bisects the vertex angles.



diagonal bisector

The diagonal connecting the vertex angles bisects the diagonal connecting the non-vertex angles.

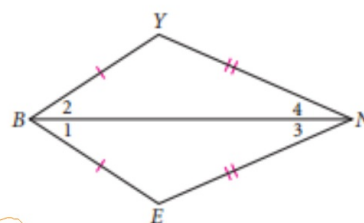


IWBAT discover properties of kites and trapezoids.

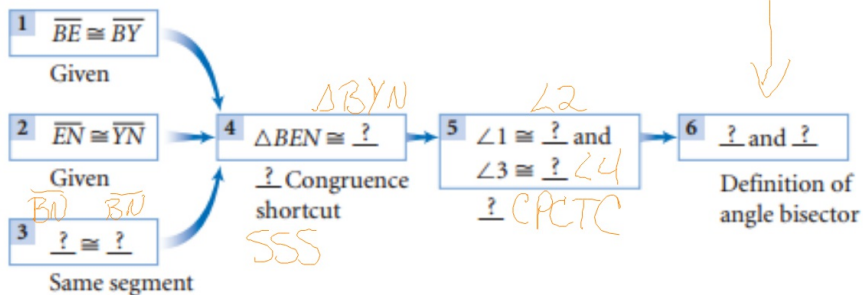
Copy and complete the flowchart to show how the Kite Angle Bisector Conjecture follows logically from one of the triangle congruence conjectures.

Given: Kite $BENY$ with $\overline{BE} \cong \overline{BY}$, $\overline{EN} \cong \overline{YN}$

Show: \overline{BN} bisects $\angle B$
 \overline{BN} bisects $\angle N$



Flowchart Proof



Kites and Trapezoid Properties

What can we say about trapezoid

- consecutive angles
- Isosceles trapezoids
- Isosceles trap diagonals?

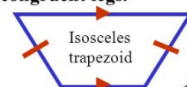
We need to form a conjecture for each.

Trapezoid

Definition: A quadrilateral with exactly one pair of parallel sides. The parallel sides are called bases and the non-parallel sides are called legs.

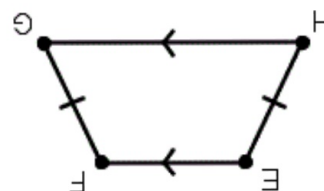
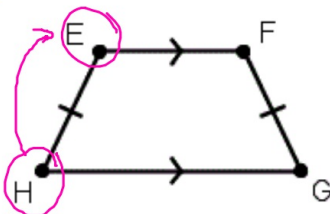


An Isosceles trapezoid is a trapezoid with congruent legs.



consecutive angles

Consecutive angles of a trapezoid are supplementary

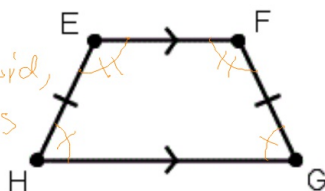


IWBAT discover properties of kites and trapezoids.

Kites and Trapezoid Properties

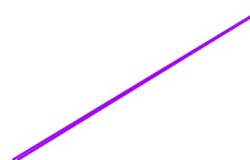
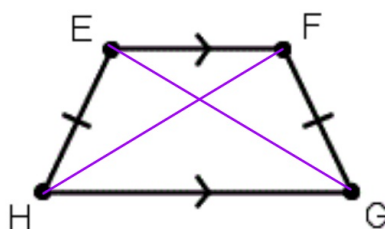
isosceles trapezoid

on an isosceles trapezoid, the pairs of base angles are congruent.



isosceles trapezoid diagonals

The diagonals of an isosceles trapezoid are congruent.



IWBAT discover properties of kites and trapezoids.

Kites and Trapezoid Properties

Exercises DG pp. 269-270 #1, 2, 4, 6, 9

IWBAT discover properties of kites and trapezoids.

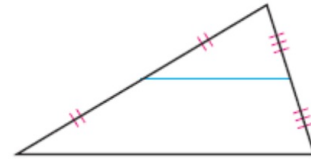
Properties of Midsegments

12/01/16

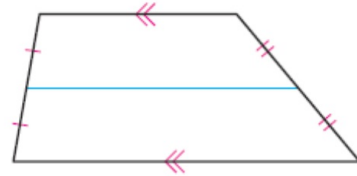
IWBAT define and discover properties of midsegments in triangles and trapezoids.

Properties of Midsegments

The segment connecting the midpoints of two sides of a triangle is the **midsegment** of a triangle.

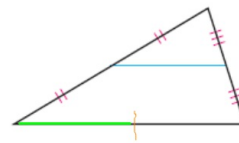


The segment connecting the midpoints of the two nonparallel sides of a trapezoid is also called the **midsegment** of a trapezoid.



Triangle Midsegment Conjecture

A midsegment of a triangle is parallel to the third side and half the length of third side.

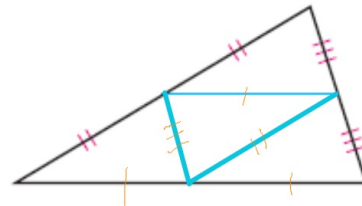


IWBAT define and discover properties of midsegments in triangles and trapezoids.

Properties of Midsegments

Three Midsegment Conjecture

The three midsegments of a triangle divide it into four congruent triangles.

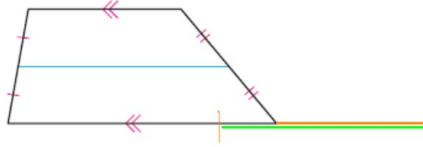


IWBAT define and discover properties of midsegments in triangles and trapezoids.

Properties of Midsegments

Trapezoid Midsegment Conjecture

The midsegment of a trapezoid is parallel to the bases and is equal in length to half of the sum of the bases



IWBAT define and discover properties of midsegments in triangles and trapezoids.

Properties of Midsegments

Exercises DG pp. 275-276 #2-4, 6, 7, 8

IWBAT define and discover properties of midsegments in triangles and trapezoids.

IWBAT discover properties of parallelograms.

Unit test Thursday, 12/8/16

Properties of Parallelograms

A **parallelogram** is a quadrilateral whose opposite sides are parallel.



- Using the lines on a piece of graph paper as a guide, draw a pair of parallel lines that are at least 6 cm apart.
- Using the parallel edges of your straightedge, make a parallelogram. Label your parallelogram LOVE.
- Look at the opposite angles. Measure the angles of parallelogram LOVE.
- Compare a pair of opposite angles using your protractor.
- Compare results with your table mates.



Parallelogram Opposite Angles Conjecture

The opposite angles of a parallelogram are Congruent.

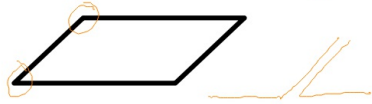


IWBAT discover properties of parallelograms.

Properties of Parallelograms

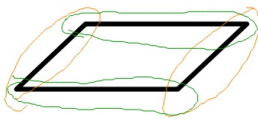
Parallelogram Consecutive Angles Conjecture

The consecutive angles of a parallelogram are supplementary.



Parallelogram Opposite Sides Conjecture

The opposite sides of a parallelogram are congruent.

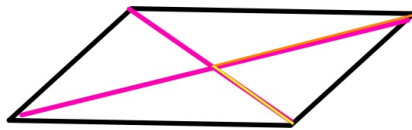


IWBAT discover properties of parallelograms.

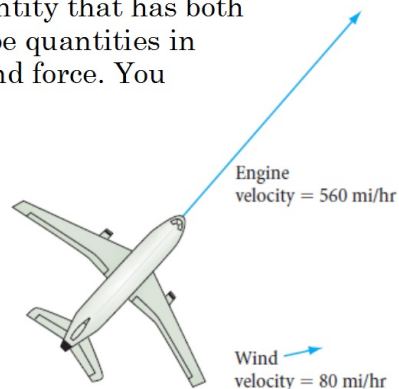
Properties of Parallelograms

Parallelogram Diagonals Conjecture

The diagonals of a parallelogram bisect each other.



Parallelograms are used in vector diagrams, which have many applications in science. A **vector** is a quantity that has both magnitude and direction. Vectors describe quantities in physics, such as velocity, acceleration, and force. You can represent a vector by drawing an arrow. The length and direction of the arrow represent the magnitude and direction of the vector. For example, a velocity vector tells you an airplane's speed and direction. The lengths of vectors in a diagram are proportional to the quantities they represent.



IWBAT discover properties of parallelograms.

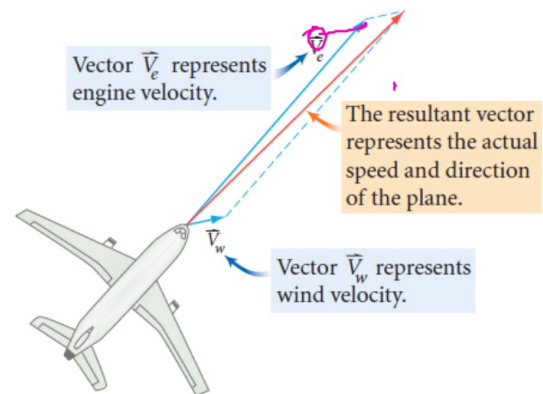
Properties of Parallelograms

In many physics problems, you combine vector quantities acting on the same object. For example, the wind current and engine thrust vectors determine the velocity of an airplane. The **resultant vector** of these vectors is a single vector that has the same effect. It can also be called a **vector sum**.

To find a resultant vector, make a parallelogram with the vectors as sides. The resultant vector is the diagonal of the parallelogram from the two vectors' tails to the opposite vertex.

In the diagram at right, the resultant vector shows that the wind will speed up the plane, and will also blow it slightly off course.

What would the pilot of this plane have to do to stay on course?



IWBAT discover properties of parallelograms.

Properties of Parallelograms

Exercises DG p. 281 #3-6, 11, 13

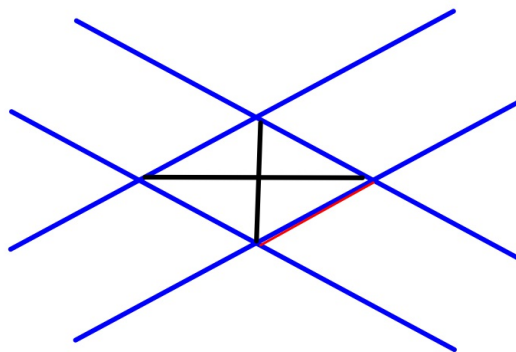
IWBAT discover properties of parallelograms.

IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Double-Edged Straightedge Conjecture

If two parallel lines are intersected by a second pair of parallel lines that are the same distance apart as the first pair, then the parallelogram formed is a rhombus?

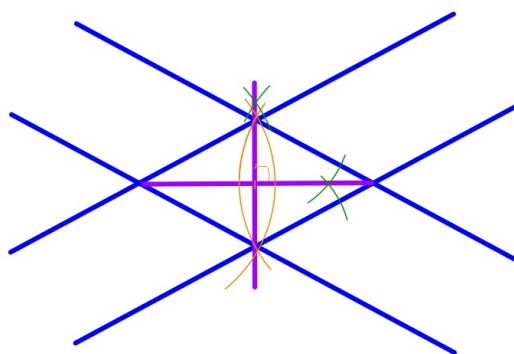


IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Rhombus Diagonals Conjecture

The diagonals of a rhombus are \perp , and they bisect the ^{angles at the} vertices.

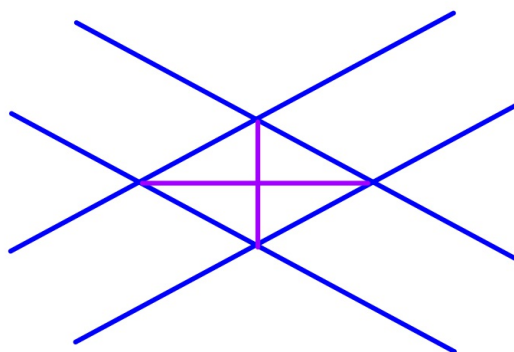


IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Rhombus Angles Conjecture

The _____ of a rhombus _____ the angles of the rhombus.

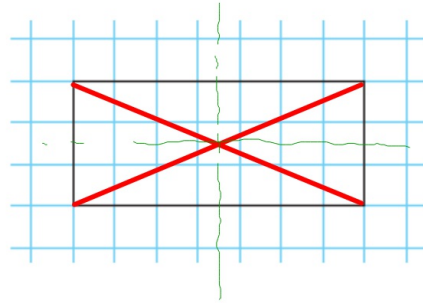


IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Rectangle Diagonals Conjecture

The diagonals of a rectangle are congruent and bisect each other

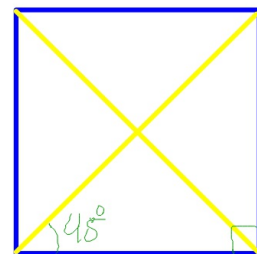


IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Square Diagonals Conjecture

The diagonals of a square are \perp , congruent, and bisect the angles



IWBAT discover properties of rhombuses, rectangles, and squares.

Properties of Special Parallelograms

Exercises DG pp. 290-291 #2-18 evens, 20, 21

IWBAT discover properties of rhombuses, rectangles, and squares.

Proving Quadrilateral Properties

12/06/16

IWBAT practice writing flowchart and paragraph proofs.

Proving Quadrilateral Properties

A concave kite is sometimes called a dart.

Given: Dart $ADBC$ with $\overline{AC} \cong \overline{BC}$, $\overline{AD} \cong \overline{BD}$

Show: \overline{CD} bisects $\angle ACB$

$\overline{AC} \cong \overline{BC}$

Given

$\overline{AD} \cong \overline{BD}$

Given

$\overline{CD} \cong \overline{CD}$

Same segment

$\triangle ACD \cong \triangle BCD$

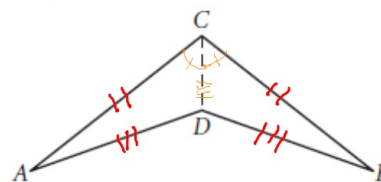
SSS

$\angle ACD \cong \angle BCD$

CPCTC

\overline{CD} bisects $\angle ACB$

Definition of an angle bisector



Given that $\overline{AC} \cong \overline{BC}$ and $\overline{AD} \cong \overline{BD}$, and $\overline{CD} \cong \overline{CD}$ because it is the same segment, $\triangle ACD \cong \triangle BCD$ via SSS. $\angle ACD \cong \angle BCD$ via CPCTC which tells us that \overline{CD} bisects $\angle ACB$ according to the definition of an angle bisector.

$\overline{AC} \cong \overline{BC}$ | Given

IWBAT practice writing flowchart and paragraph proofs.

Proving Quadrilateral Properties

Paragraph proof

"It is given that $\overline{AC} \cong \overline{BC}$ and $\overline{AD} \cong \overline{BD}$. $\overline{CD} \cong \overline{CD}$ because it is the same segment in both triangles. So, $\triangle ADC \cong \triangle BDC$ by the SSS Congruence Conjecture. So, $\angle ACD \cong \angle BCD$ by the definition of congruent triangles (CPCTC). Therefore, by the definition of angle bisectors, \overline{CD} is the bisector of $\angle ACB$. Q.E.D."

The abbreviation Q.E.D. at the end of a proof stands for the Latin phrase *quod erat demonstrandum*, meaning "which was to be demonstrated."

IWBAT practice writing flowchart and paragraph proofs.

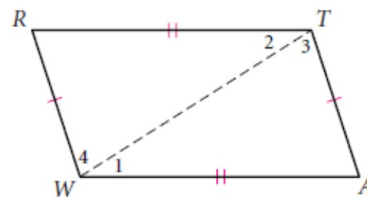
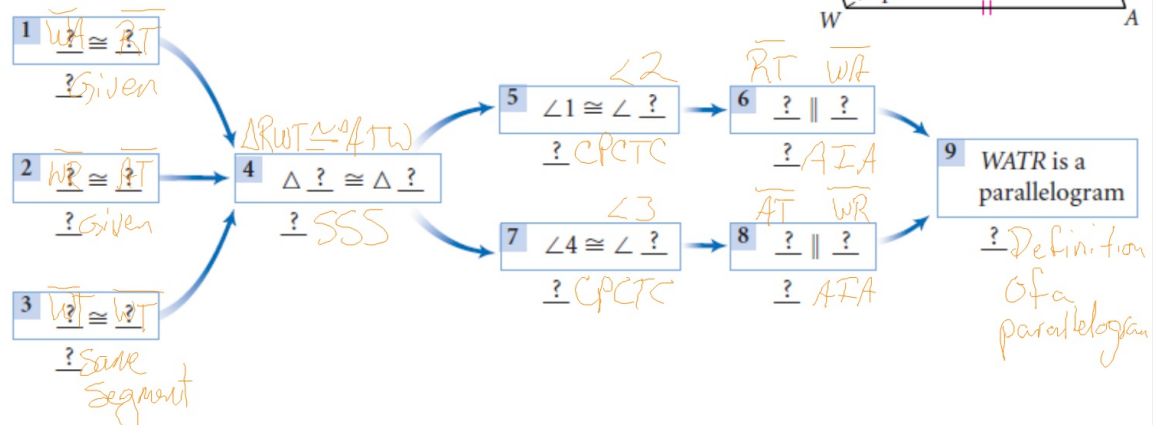
Proving Quadrilateral Properties

Prove the conjecture: If the opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

Given: Quadrilateral $WATR$, with $\overline{WA} \cong \overline{RT}$ and $\overline{WR} \cong \overline{AT}$, and diagonal \overline{WT}

Show: $WATR$ is a parallelogram

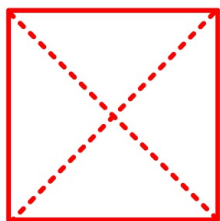
Flowchart Proof



IWBAT practice writing flowchart and paragraph proofs.

Proving Quadrilateral Properties

Exercises p. 297 #7 & 9



IWBAT practice writing flowchart and paragraph proofs.

pp. 300-304 #14, 15, 21-24, 25, 27

What should be in your notebook as of today:

Exercises pp. 200-201 DG #1-22 Evens

Exercises DG pp. 257-8 #1, 2, 5, 6, 8-11

Exercises DG p. 262 #1, 4-12 all

Exercises DG pp. 269-270 #1, 2, 4, 6, 9

Exercises DG pp. 275-276 #2-4, 6, 7, 8

Exercises DG p. 281 #3-6, 11, 13

Exercises DG pp. 290-291 #2-18 evens, 20, 21